Claims

What is claimed is:

1. A conductive ferromagnetic composition of matter comprising: (a) linearly conjugated B-systems; (b) residues of sulfonated lignin or a sulfonated polyflavonoid or a derivative of a sulfonated lignin or a sulfonated polyflavonoid; and (c) ferromagnetic iron oxide particles.

2. The composition of claim 1 wherein the composition is dispersible in water-based resins.

3. The composition of claim 1 wherein the iron oxide particles are stable at a pH of about 3.

4. The composition of claim 1 wherein the iron oxide particles are stable at a pH of about 2.

5. The composition of claim 1 wherein the iron oxide particles are stable at a pH of about 1.

6. The composition of claim 1 wherein the iron oxide particles are crystalline.

7. The composition of claim 1 wherein the iron oxide particles have an average diameter of from about 5 nm to about 50 nm.

8. The composition of claim 1 wherein the iron oxide particles are magnetite, alpha-Fe_2O_3, or gamma-Fe_2O_3.

9. The composition of claim 1 wherein the iron oxide particles are magnetite.

10. The compostion of claim 1 wherein the linearly conjugated B-systems comprise polyanilines.

11. The composition of claim 1 wherein the linearly conjugated B-systems comprise polypyrroles or polythiophenes.

12. The composition of claim 1 wherein the linearly conjugated B-systems comprise repeating monomer units of aniline, thiophene, pyrrole, or phenylmercaptan, wherein the repeating monomer units of aniline, thiophene, pyrrole, or phenylmercaptan are optionally ring-substituted with one or more halo, straight or branched (C_1-C_6)alkyl, (C_1-C_6)alkoxy, or (C_1-C_6)alkoxy(C_1-C_6)alkyl groups.

13. The composition of claim 1 wherein the linearly conjugated B-systems comprise repeating monomer units selected from the group consisting of aniline; o-ethylaniline; m-ethylaniline; o-ethoxyaniline; m-butylaniline; m-hexylaniline; m-octylaniline; 4-bromoaniline; 2-bromoaniline; 3-bromoaniline; 3-acetamidoaniline; 4-acetamidoaniline; 5-chloro-2-methoxyaniline; 5-chloro-2-ethoxyaniline; 2,5-dimethylaniline; 2,3-dimethylaniline; 2,5-dibutylaniline; 2,5-dimethoxyaniline; tetrahydronaphthylamine; 2-cyanoaniline; 2-thiomethylaniline; 3-(n-butanesulfonic acid)aniline; 2,4-dimethoxyaniline; 4-mercaptoaniline; 4-methylthioaniline; 3-phenoxyaniline; 4-phenoxyaniline; thiophene; pyrrole; and thiophenol.

14. The composition of claim 1 wherein the linearly conjugated B-systems comprise repeating monomer units selected from the group consisting of aniline, o-methoxyaniline, o-ethoxyaniline, and pyrrole.

15. The composition of claim 1 wherein the linearly conjugated B-systems are grafted to the residues.

16. The composition of claim 1 wherein the residues are of sulfonated lignin.

17. The composition of claim 1 wherein the residues are of a sulfonated polyflavonoid.

18. The composition of claim 1 wheerin the derivative comprises one or more hydroxy, methoxy, ethoxy, hydroxymethyl, 2-hydroxyethoxy, 2-[(*N*-1,1-dimethyl-2-sulfoethylamino)carbonyl]ethyl, or 2-carboxyethyl substituents.

19. The composition of claim 1 further comprising a binder.

20. The composition of claim 19 wherein the binder is a film-forming resin.

21. The composition of claim 20 wherein the composition is a latex.

22. The composition of claim 21 wherein the latex is a water-based latex.

23. The composition of claim 20 wherein the film-forming resin is selected from the group consisting of polyurethanes, epoxies, neutral resins, acidic resins, acrylics, polyesters, glycidyl acrylates, polyamides, polyimides, polyaramides, polycarbonates, polymethyl methacrylates, poly(amide-imides), polyvinyl fluorides, urea-formaldehyde, phenol-formaldehyde, melamine-formaldehyde, and combinations thereof.

24. The composition of claim 20 wherein the resin is a formaldehyde-based resin.

25. The composition of claim 20 wherein the formaldehyde-based resin is melamine-formaldehyde resin, phenyl-formaldehyde resin, or urea-formaldehyde resin.

26. The composition of claim 20 wherein the film-forming resin comprises an acrylic resin and a melamine formaldehyde resin.

27. The composition of claim 20 wherein the film-forming resin is a water-borne resin.

28. The composition of claim 20 wherein the film-forming resin is an organic-solvent-borne

resin.

29. A barrier to electromagnetic radiation comprising:

(a) linearly conjugated B-systems and residues of sulfonated lignin or a sulfonated polyflavonoid or a derivative of a sulfonated lignin or a sulfonated polyflavonoid; and

(b) ferromagnetic iron oxide particles.

30. The barrier of claim 29 further comprising a binder.

31. The barrier of claim 30 wherein the binder is a film-forming resin.

32. The barrier of claim 29 wherein the barrier is applied as a thin film.

33. The barrier of claim 29 wherein the barrier is a wall.

34. The barrier of claim 29 wherein the barrier is an enclosure.

35. The barrier of claim 29 wherein the barrier substantially encloses a device.

36. The barrier of claim 35 wherein the device is a component of an electronic apparatus.

37. The barrier of claim 35 wherein the device is an information handling system.

38. The barrier of claim 35 wherein the device is a computer or a component of a computer.

39. The barrier of claim 35 wherein the device is capable of producing radiation.

40. The barrier of claim 35 wherein the device is sensitive to radiation.

41. The barrier of claim 29 wherein the barrier is a filter.

42. An apparatus comprising:

a substrate; and

a ferromagnetic layer on the substrate, wherein the ferromagnetic layer comprises (a) linearly conjugated B-systems; (b) residues of sulfonated lignin or a sulfonated polyflavonoid or a derivative of sulfonated lignin or a sulfonated polyflavonoid; and (c) iron oxide particles.

43. The apparatus of claim 42 wherein the substrate is a disc and the ferromagnetic layer stores information in magnetic domains.

44. The apparatus of claim 43 wherein the disc is a hard disc.

45. The apparatus of claim 43 wherein the disc is a flexible disc.

46. The apparatus of claim 42 wherein the apparatus further comprises a transducer in transducing relationship to the ferromagnetic layer, wherein the transducer reads and writes domains of magnetization representative of data.

47. The apparatus of claim 42 further comprising:

a base, wherein the substrate is a disc rotatably attached to the base; and

an actuator assembly movably attached to the base, wherein the transducer is affixed to the actuator assembly.

48. The apparatus of claim 42, further comprising:

a processor;

a memory operatively coupled to the processor; and

an input / output subsystem operatively coupled to the processor and to the disc.

49. The apparatus of claim 43 further comprising:

a voice coil attached to the actuator assembly, the voice coil forming a portion of a voice coil motor; and

a current driver for the voice coil which determines an actual velocity of the actuator and transducer, wherein an amount of current delivered to the voice coil is determined, in part, by a force constant determined during an acceleration phase of a movement of the actuator and transducer.

50. The apparatus of claim 49 wherein the disc is a hard disc.

51. The apparatus of claim 49 wherein the disc is a flexible disc.

52. The apparatus of claim 42 wherein the substrate is a metal.

53. The apparatus of claim 43 wherein the ferromagnetic layer further comprises a film-forming resin.

54. A method of shielding an article from electromagnetic radiation, comprising the step of interposing an electromagnetic shielding material between the article and one or more sources of electromagnetic radiation; the electromagnetic shielding material comprising: (a) linearly conjugated B-systems; (b) residues of sulfonated lignin or a sulfonated polyflavonoid or a derivative of a sulfonated lignin or a sulfonated polyflavonoid; and (c) ferromagnetic iron oxide particles.

55. The method of claim 54 wherein the shielding material further comprises a binder.

56. A method for preparing a conductive ferromagnetic composition of matter comprising combining (1) a polymer comprising (a) linearly conjugated B-systems, and (b) sulfonated lignin or a sulfonated polyflavonoid or a derivative of sulfonated lignin or a sulfonated polyflavonoid;

and (2) a source of ferromagnetic iron oxide particles.

57. The method of claim 56 wherein the polymer is formed by combining (a) sulfonated lignin or a sulfonated polyflavonoid or a derivative of sulfonated lignin or a sulfonated polyflavonoid, (b) one or more monomers, (c) an initiator, and (d) a solvent.

58. The method of claim 57 wherein the monomer is selected from the group consisting of aniline; o-ethylaniline; m-ethylaniline; o-ethoxyaniline; m-butylaniline; m-hexylaniline; m-octylaniline; 4-bromoaniline; 2-bromoaniline; 3-bromoaniline; 3-acetamidoaniline; 5-chloro-2-methoxyaniline; 5-chloro-2-ethoxyaniline; 2,5-dimethylaniline; 2,3-dimethylaniline; 2,5-dibutylaniline; 2,5-dimethoxyaniline; tetrahydronaphthylamine; 2-cyanoaniline; 2-thiomethylaniline; 3-(n-butanesulfonic acid)aniline; 2,4-dimethoxyaniline; 4-mercaptoaniline; 4-methylthioaniline; 3-phenoxyaniline; 4-phenoxyaniline; thiophene; pyrrole; and thiophenol.

59. The method of claim 57 wherein the initiator is hydrogen peroxide, ferric trichloride, potassium permanganate, or potassium persulfate.

60. The method of claim 57 wherein the solvent comprises water.

61. The method of claim 57 wherein the solvent is water.

62. The method of claim 56 wherein the source of iron oxide particles is iron cations.

63. The method of claim 62 wherein the iron cations are ferrous ions in a solvent.

64. The method of claim 63 wherein the solvent comprises water.

65. The method of claim 64 wherein the solvent is water.

66. The method of claim 56 wherein the source of ferromagnetic iron oxide particles is preformed ferromagnetic iron oxide particles.

67. The conductive ferromagnetic composition of matter prepared by the method of claim 56.

68. A method of forming a conductive ferromagnetic composition of matter comprising:

combining in a mixture (1) a polymer comprising (a) linearly conjugated B-systems, and (b) sulfonated lignin or a sulfonated polyflavonoid or a derivative of sulfonated lignin or a sulfonated polyflavonoid; and (2) ferrous ions; and (3) an aqueous solvent; and

adding a base to adjust the pH of the mixture to at least about 7.

69. The method of claim 68 wherein the pH after adding the base is at least about 9.

70. The method of claim 68 wherein the pH after adding the base is about 12.

71. The method of claim 68 further comprising the step of heating the mixture to at least about 50°C.

72. The method of claim 71 wherein in the heating step the mixture is heated to about 80-90°C.

73. The method of claim 68 further comprising removing the solvent and base, and washing the composition with an acidic solution with a pH of at most about 4.

74. The method of claim 73 wherein the pH of the acidic solution is about 1.6.

75. A conductive ferromagnetic composition of matter prepared by the method of claim 68.